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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

ART UNIT	PAPER NUMBER
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DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/651,217

Applicant(s)

COBBLEY ET AL

Examiner

Scott Geyer

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. See 35 U.S.C. § 133.
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 04 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-14 and 22-64 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-14, 22-27, 29, 31-39, 41 and 43-64 is/are rejected.
- 7) ☐ Claim(s) 28, 30, 40 and 42 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 30 August 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other

DETAILED ACTION

Drawings

1. The drawings as submitted by applicant on 30 August 2000 are acceptable.

Specification

2. The specification as submitted by applicant is acceptable.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made

4. Claims 1-6 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) in view of Kato et al. (3,825,580).

Farnworth et al. teach a wafer with a surface. An adhesive is applied to certain areas of the surface for attaching semiconductor die (column 2, lines 56 et seq.). There are singulating lines on the wafer so as to separate the wafer into individual dies after completing the adhesion step (column 5, lines 19 et seq.). Bond pads are also left exposed (column 5, lines 30 et seq.). The adhesive is applied using hot or cold screen process, depositing and photo-patterning a photosensitive adhesive or using a resist etch back method (see abstract).

Farnworth et al. do not teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive or the monomer formula of such an adhesive or additives for the adhesive.

However, Kato et al. do teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive (column 1, lines 33-35). Kato et al. further teach the formula as in applicant's claim 9, wherein the R group can be an alkenyl, alkynyl, alkenyloxyalkyl or cycloalkenyl (column 1, lines 56-66). Also, acidic stabilizers, polymerization inhibitors, plasticizers, monomers, viscosity increasing polymers and dyes can be added to the adhesive to alter the adhesive's characteristics (column 2, lines 55 et seq.).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the disclosures of Farnworth et al. with Kato et al. to provide for a good quality adhesive to quickly and soundly adhere a die to a lead frame. It is well known in the art that cyanoacrylate adhesives are excellent for binding to glass, metals and plastics, and it would be obvious to use this type of adhesive with a lead-frame as they are commonly metal. It would further have been obvious to coat the instant setting adhesive only in areas that are intended to have a semiconductor die mounted thereon, as correcting a die misplaced would be difficult due to the nature of the adhesive.

Therefore, it would have been obvious to combine Kato et al. with Farnworth et al. to obtain the invention as specified in claims 1-6 and 8-10.

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5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) and Kato et al. (3,825,580) as applied to claim 1 above, and further in view of Mones et al. (4,172,907).

Neither Farnworth et al. nor Kato et al. teach an adhesion promoter applied to the surface of a wafer prior to applying the adhesive.

However, Mones et al. do disclose applying a thin first coating of adhesion promoter to a surface of a circuit element before the adhesion is applied (column 6, claim 2).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art at to combine the disclosures of Mones et al. with Farnworth et al. and Kato et al. to provide effective bonding of the die to the lead frame using a bonding promoter. It is well known in the art that adhesion promoters increase the effectiveness of the bond between two surfaces.

Therefore, it would have been obvious to combine Mones et al. with Kato et al. and Farnworth et al. to obtain the invention as specified in claim 7.

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6. Claims 11-14, 22-27 and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) in view of Kato et al. (3,825,580) and Kameyama et al. (4,720,513).

Farnworth et al. teach a wafer with a surface. An adhesive is applied to certain areas of the surface for attaching semiconductor die, and also attaching die to the lead fingers (column 2, lines 56 et seq.). Bond pads are also left exposed (column 5, lines 30 et seq.). The adhesive is applied using hot or cold screen process, depositing and photo-patterning a photosensitive adhesive or using a resist etch back method (see

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abstract). Farnworth et al. also teach a mounting paddle with adhesive applied thereon and attached to a die (column 1, lines 30-41).

Farnworth et al. do not teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive or the monomer formula of such an adhesive.

However, Kato et al. do teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive (column 1, lines 33-35).

Kameyama et al. teach a thixotropic index for an instant setting adhesive in the range of 3 and greater (column 2, lines 56 et seq., continuing to column 3, lines 1-6).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the disclosures of Farnworth et al. with Kato et al. to provide for a good quality adhesive to quickly and soundly adhere a die to a lead frame. It is well known in the art that cyanoacrylate adhesives are excellent for binding to glass, metals and plastics, and it would be obvious to use this type of adhesive with a lead-frame as they are commonly metal. It would further have been obvious to coat the instant setting adhesive only in areas that are intended to have a semiconductor die mounted thereon, as correcting a die misplaced would be difficult due to the nature of the adhesive.

Therefore, it would have been obvious to combine Kameyama et al. with Kato et al. and Farnworth et al. to obtain the invention as specified in claims 11-14 and 22-27 and 31-33.

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7. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) and Kato et al. (3,825,580) as applied to claim 22 above, and further in view of Brooks et al. (6,049,125).

Neither Farnworth et al. nor Kato et al. teach a heat sink attached to a device with an instant setting adhesive.

However, Brooks et al. disclose a layer of adhesive, such as cyanoacrylate, to attach a heat sink to an encapsulated semiconductor die (column 4, lines 61 et seq.).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the disclosures of Brooks et al. with Farnworth et al. and Kato et al. to provide a semiconductor device with a heat sink attached. It is well known in the art to use a heat sink to effectively channel heat away from the semiconductor device during its operation.

Therefore, it would have been obvious to combine Brooks et al. with Kato et al. and Farnworth et al. to obtain the invention as specified in claim 29.

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8. Claims 34-39 and 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) in view of Kato et al. (3,825,580).

Farnworth et al. teach a wafer with a surface. An adhesive is applied to certain areas of the surface for attaching semiconductor die, and also attaching die to the lead fingers (column 2, lines 56 et seq.). Bond pads are also left exposed (column 5, lines 30 et seq.). The adhesive is applied using hot or cold screen process, depositing and photo-patterning a photosensitive adhesive or using a resist etch back method (see

abstract). Farnworth et al. also teach a mounting paddle with adhesive applied thereon and attached to a die (column 1, lines 30-41). Farnworth et al. also disclose a hot screen patterning process for the adhesive at a temperature range between 100°C and 500°C (column 6, lines 33-36).

Farnworth et al. do not teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive or the monomer formula of such an adhesive.

However, Kato et al. do teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive (column 1, lines 33-35).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art at to combine the disclosures of Farnworth et al. and Kato et al. to provide for a good quality adhesive to quickly and soundly adhere a die to a lead frame. It is well known in the art that cyanoacrylate adhesives are excellent for binding to glass, metals and plastics, and it would be obvious to use this type of adhesive with a lead-frame as they are commonly metal. It would further have been obvious to coat the instant setting adhesive only in areas that are intended to have a semiconductor die mounted thereon, as correcting a die misplaced would be difficult due to the nature of the adhesive.

Therefore, it would have been obvious to combine Kato et al. with Farnworth et al. to obtain the invention as specified in claims 34-39 and 45.

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9. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) and Kato et al. (3,825,580) as applied to claim 34 above, and further in view of Brooks et al. (6,049,125).

Neither Farnworth et al. or Kato et al. teach a heat sink attached to a device with an instant setting adhesive.

However, Brooks et al. disclose a layer of adhesive, such as cyanoacrylate, to attach a heat sink to an encapsulated semiconductor die (column 4, lines 61 et seq.).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the disclosures of Brooks et al. with Farnworth et al. and Kato et al. to provide a semiconductor device with a heat sink attached. It is well known in the art to use a heat sink to effectively channel heat away from the semiconductor device during its operation.

Therefore, it would have been obvious to combine Brooks et al. with Kato et al. and Farnworth et al. to obtain the invention as specified in claim 41.

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10. Claims 46-53, 55 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) in view of Kato et al. (3,825,580).

Farnworth et al. teach a wafer with a surface. An adhesive is applied to certain areas of the surface for attaching semiconductor die, and also attaching die to the lead fingers (column 2, lines 56 et seq.). There are singulating lines on the wafer so as to separate the wafer into individual dies after completing the adhesion step (column 5, lines 19 et seq.). Bond pads are also left exposed (column 5, lines 30 et seq.)

Farnworth et al. also teach a mounting paddle with adhesive applied thereon and attached to a die (column 1, lines 30-41). Farnworth et al. further teach applying pressure and elevated temperature as the bonding is completed (see abstract) and a lead-on-chip frame as the lead frame for bonding to chips (column 3, lines 15 et seq.). Farnworth et al. also disclose a hot screen patterning process for the adhesive at a temperature range between 100°C and 500°C (column 6, lines 33-36).

Farnworth et al. do not teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive or the monomer formula of such an adhesive.

However, Kato et al. do teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive (column 1, lines 33-35).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art at to combine the disclosures of Farnworth et al. with Kato et al. to provide for a good quality adhesive to quickly and soundly adhere a die to a lead frame. It is well known in the art that cyanoacrylate adhesives are excellent for binding to glass, metals and plastics, and it would be obvious to use this type of adhesive with a lead-frame as they are commonly metal. It would further have been obvious to coat the instant setting adhesive only in areas that are intended to have a semiconductor die mounted thereon, as correcting a die misplaced would be difficult due to the nature of the adhesive.

Therefore, it would have been obvious to combine Kato et al. with Farnworth et al. to obtain the invention as specified in claims 46-53, 55 and 56.

12. Claim 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) and Kato et al. (3,825,580) as applied to claim 53 above, and further in view of Eichelberger (5,841,193).

Neither Farnworth et al. or Kato et al. teach applying a catalyst to one surface of the lead fingers before the die placing step.

However, Eichelberger discloses applying a catalyst to one surface while the cyanoacrylate adhesive is applied to the other surface (column 10, lines 34-38).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the disclosures of Eichelberger with that of Farnworth et al. and Kato et al. to apply an adhesive to one surface to be bonded and to apply a catalyst to the other surface to be bonded to ensure an instantaneous seal.

Therefore, it would have been obvious to combine Eichelberger with Kato et al., Farnworth et al. to obtain the invention as specified in claim 54.

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13. Claims 57, 58, 59 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) in view of Kato et al. (3,825,580).

Farnworth et al. teach a wafer with a surface. An adhesive is applied to certain areas of the surface for attaching semiconductor die (column 2, lines 56 et seq.). There are singulating lines on the wafer so as to separate the wafer into individual dies after completing the adhesion step (column 5, lines 19 et seq.). Bond pads are also left exposed (column 5, lines 30 et seq.). The adhesive is applied using hot or cold screen process, depositing and photo-patterning a photosensitive adhesive or using a resist

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etch back method (see abstract). Farnworth et al. also teach a mounting paddle with adhesive applied thereon and attached to a die (column 1, lines 30-41). Farnworth et al. further teach applying pressure and elevated temperature as the bonding is completed (see abstract). Farnworth et al. also disclose a hot screen patterning process for the adhesive at a temperature range between 100°C and 500°C (column 6, lines 33-36).

Farnworth et al. do not teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive, the monomer formula of such an adhesive or additives for the adhesive.

However, Kato et al. do teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive (column 1, lines 33-35). Kato et al. further teach the formula as in applicant's claim 58, wherein the R group can be an alkenyl, alkynyl, alkenyloxyalkyl or cycloalkenyl (column 1, lines 56-66). Also, acidic stabilizers, polymerization inhibitors, plasticizers, monomers, viscosity increasing polymers and dyes can be added to the adhesive to alter the adhesive's characteristics (column 2, lines 55 et seq.).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the disclosures of Farnworth et al. with Kato et al. to provide for a good quality adhesive to quickly and soundly adhere a die to a lead frame. It is well known in the art that cyanoacrylate adhesives are excellent for binding to glass, metals and plastics, and it would be obvious to use this type of adhesive with a lead-frame as they are commonly metal. It would further have been obvious to coat the

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instant setting adhesive only in areas that are intended to have a semiconductor die mounted thereon, as correcting a die misplaced would be difficult due to the nature of the adhesive.

Therefore, it would have been obvious to combine Kato et al. with Farnworth et al. to obtain the invention as specified in claims 57, 58, 59 and 61.

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14. Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al.(5,286,679) and Kato et al. (3,825,580) as applied to claim 57 above, and further in view of Farnworth et al. (5,893,726).

Neither Farnworth et al.('679) or Kato et al. teach applying adhesive in the form of a pattern of dots.

Farnworth et al.('726) disclose a pattern of dots to adhere a protective cover to a substrate.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art at to combine the disclosures of Farnworth et al.('726) with that of Farnworth et al.('726) and Kato et al. to attach a die to a lead frame. Although the Farnworth et al.('726) discloses attaching a protective seal to a substrate, it would have been obvious to one of ordinary skill in the art to use a good quality adhesive, such as an instant setting adhesive, to attach a die to a lead frame in a pattern of dots.

Farnworth et al.('726) teach that a quantity of adhesive, in a pattern of dots, is strong enough o hold a protective cover on top of a semiconductor die, then the same pattern could have been used to hold the semiconductor die to the substrate

Therefore, it would have been obvious to combine Farnworth, et al.('726) with Kato et al. and Farnworth et al.('679) to obtain the invention as specified in claim 60.

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15. Claims 62 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al. (5,286,679) in view of Kato et al. (3,825,580).

Farnworth et al. teach a wafer with a surface. An adhesive is applied to certain areas of the surface for attaching semiconductor die (column 2, lines 56 et seq.). There are singulating lines on the wafer so as to separate the wafer into individual dies after completing the adhesion step (column 5, lines 19 et seq.). Bond pads are also left exposed (column 5, lines 30 et seq.). The adhesive is applied using hot or cold screen process, depositing and photo-patterning a photosensitive adhesive or using a resist etch back method (see abstract). Farnworth et al. also teach a mounting paddle with adhesive applied thereon and attached to a die (column 1, lines 30-41). Farnworth et al. further teach applying pressure and elevated temperature as the bonding is completed (see abstract).

Farnworth et al. do not teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive, the monomer formula of such an adhesive.

However, Kato et al. do teach an instant setting adhesive such as a cyanoacrylate or an anaerobic acrylic adhesive (column 1, lines 33-35). Kato et al. further teach the formula as in applicant's claim 64, wherein the R group can be an alkenyl, alkynyl, alkenyloxyalkyl or cycloalkenyl (column 1, lines 56-66)

At the time of the invention, it would have been obvious to a person of ordinary skill in the art at to combine the disclosures of Farnworth et al. with Kato et al. to provide for a good quality adhesive to quickly and soundly adhere a die to a lead frame. It is well known in the art that cyanoacrylate adhesives are excellent for binding to glass, metals and plastics, and it would be obvious to use this type of adhesive with a lead-frame as they are commonly metal. It would further have been obvious to coat the instant setting adhesive only in areas that are intended to have a semiconductor die mounted thereon, as correcting a die misplaced would be difficult due to the nature of the adhesive.

Therefore, it would have been obvious to combine Kato et al. with Farnworth et al. to obtain the invention as specified in claims 62 and 64.

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16. Claim 63 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farnworth et al.(5,286,679) and Kato et al. (3,825,580) as applied to claim 62 above, and further in view of Eichelberger (5,841,193).

Neither Farnworth et al. or Kato et al. teach applying a catalyst to one surface of the lead fingers before the die placing step.

However, Eichelberger discloses applying a catalyst to one surface while the cyanoacrylate adhesive is applied to the other surface(column 10, lines 34-38).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art at to combine the disclosures of Eichelberger with that of Farnworth et al.

and Kato et al. to apply an adhesive to one surface to be bonded and to apply a catalyst to the other surface to be bonded to ensure an instantaneous seal.

Therefore, it would have been obvious to combine Eichelberger with Kato et al., Farnworth et al. to obtain the invention as specified in claim 63.

Allowable Subject Matter

17. Claims 28, 30, 40 and 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott Geyer whose telephone number is (703)306-5866. The examiner can normally be reached on weekdays, between 9:00am - 5:30pm. The examiner may also be reached via e-mail: **scott.geyer@uspto.gov**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles L. Bowers can be reached on (703)308-2417. The fax phone numbers for the organization where this application or proceeding is assigned are (703)305-0142 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

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sbg
October 30, 2001

Charles J. ...
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